

Draft Assessment and Measurement Endpoints, Including LOEs

Receptor of Concern	Assessment Endpoint	Measures of Effect and Exposure (Measurement Endpoints)	Lines of Evidence in Support of ME	Weight of Evidence Scores, R3 Data Gaps, etc. --->
Benthic				
The benthic community	Survival, growth and reproduction	Sediment toxicity testing to empirically assess adverse effects	<i>Concentration in sediment compared to levels estimated by the empirically derived Portland Harbor predictive model to exhibit effects. Model should include pooled endpoints for both species</i>	
			<i>Sediment toxicity testing, lethal and sublethal</i>	
		Water exposure concentrations compared to AWQC or TRVs	<i>Concentration in surface water relative to reported AWQC or literature TRVs</i>	
			<i>Concentration in TZW relative to reported AWQC or literature TRVs</i>	
		Benthic tissue data (modeled, lab, and field-collected) compared to tissue-based TRVs	<i>Accumulated whole body concentration relative to tissue TRVs</i>	
		Bulk sediment concentrations vs. sediment quality guidelines (SQGs)	<i>Concentration in sediment compared to SQGs reported in the literature to exhibit effects</i>	
Shellfish (bivalves)	Survival, growth and reproduction	Benthic tissue data (modeled, lab, and field-collected) compared to tissue-based TRVs	<i>Tissue-based TRVs (provided sufficient clam tissue can be obtained). For TBT, derive a site specific biota-sediment accumulation factor or use screening value based on sediment concentrations¹.</i>	
		Sediment toxicity testing to empirically assess adverse effects	<i>Hyalella and Chironomus results used as bivalve surrogates?</i>	
Crayfish	Survival, growth and reproduction	Tissue based TRV approach.	<i>Accumulated whole body concentration relative to tissue TRVs</i>	

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Fish				
Invertivore				
Juvenile Chinook Salmon, Peamouth, and Sculpin ²	Survival, growth, and reproduction (including reproduction as a surrogate for growth for juvenile chinooks)	Water exposure concentrations compared to AWQC or TRVs	<i>Concentration in surface water relative to reported AWQC or literature values</i>	
			<i>Concentration in transition zone water relative to reported AWQC or literature values</i>	
		Tissue data compared to tissue-based TRVs (chemical-dependent)	<i>Accumulated whole body concentration relative to tissue residue critical tissue values</i>	
		Dietary dose compared to dietary TRVs (chemical- dependent)	<i>Dietary Dose compared to dietary toxicity reference values</i>	
		Fish condition or incidence of lesions (primarily for PAHs)	<i>Compare lesion incidence to areas of contamination and/or lesion-based TRVs (if relevant to receptor sps.)</i>	
		Bulk sediment concentrations vs. sediment quality guidelines (SQGs)	<i>Sediment Guidelines that Consider Fish Effects (ERLs ERM, TELs/PELs, SQALs)</i>	
Adult Chinook Salmon ²	Survival, growth and reproduction	Comparsion of surface water concentrations to olfaction-based TRVs for metals	<i>Adult Chinook salmon will be assessed for olfactory function of returning, pre-spawning adults. Surface water data will be evaluated to determine if contaminant concentrations may cause changes to olfactory function that may affect swimming, homing behavior and ultimately reproduction.</i>	

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Omnivore/Herbivore				
Carp (Surrogate Fish Tissue) ^{3,4}	Survival, growth and reproduction	Tissue data compared to tissue-based TRVs (chemical-dependent)	Tissue-based TRV approach for dioxin-likecontaminants using literature values and incorporating toxic equivalent (TEQs) based on the World Health Organization toxic equivalent factors (TEFs). Risk from other compounds assessed in uncertainty analysis.	
White sturgeon, smallmouth bass, and Largescale Sucker ^{2,3,5}	Survival, growth and reproduction	Water exposure concentrations compared to AWQC or TRVs	Concentration in surface water relative to reported AWQC or literature values	
		Tissue data compared to tissue-based TRVs (chemical-dependent)	Accumulated whole body concentration relative to tissue residue critical tissue values	
		Dietary dose compared to dietary TRVs (chemical-dependent)	Dietary Dose compared to dietary toxicity reference values	
		Fish condition or incidence of lesions (primarily for PAHs)	Compare lesion incidence to areas of contamination and/or lesion-based TRVs (if relevant to receptor sps.)	
		Bulk sediment concentrations vs. sediment quality guidelines (SQGs)	Sediment Guidelines that Consider Fish Effects (ERLs ERM, TELs/PELs, SQALs)	
Piscivores				
Northern Pikeminnow (and smallmouth bass? This is in Table 1 of 15 March Framework)	Survival, growth and reproduction	Water exposure concentrations compared to AWQC or TRVs	Concentration in surface water relative to reported AWQC or literature values	
		Tissue data compared to tissue-based TRVs (chemical-dependent)	Accumulated whole body concentration relative to tissue residue critical tissue values	
		Dietary dose compared to dietary TRVs (chemical-dependent)	Dietary Dose compared to dietary toxicity reference values	

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Detritivores				
Pacific Lamprey Amocoetes	Survival and growth	Tissue data compared to tissue-based TRVs (chemical-dependent)	Tissue residue concentrations compared to relevant TRV or surrogate. In absence of tissue data, modeling to determine dietary and tissue concentrations.	
		Water exposure concentrations compared to AWQC or TRVs	Compare water concentrations to literature-based or AWQC criteria for protection of early life stages.	
Wildlife				
Bald Eagle	Survival, growth and reproduction	Dietary dose (empirical or modeled via food chain or FWM) compared to dietary TRVs	Dietary-based approach incorporating food chain transfer of contaminants from appropriate fish species (assuming all exposure comes from prey fish). Assess dioxin-like contaminants using a TEQ approach based on appropriate surrogate fish tissue data. Use TRVs based on the most sensitive life stages, which include egg or embryo-based TRVs for DDT and metabolites, PCBs, and dioxin-like compounds. Egg concentrations will be determined by egg analysis or by food chain modeling.	
Hooded Merganser	Survival, growth and reproduction	Dietary dose (empirical or modeled via food chain or FWM) compared to dietary TRVs	Dietary based TRV approach. Dietary based analysis using sculpin and/or invertebrate tissue data to represent feeding guild. In the absence of appropriate fish and invertebrate tissue concentrations, modeled concentrations will be used. For dioxin like contaminants (carp or appropriate prey species), use a TEQ-based approach to assess reproductive effects.	

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Osprey	Survival, growth and reproduction	Dietary dose (empirical or modeled via food chain or FWM) compared to dietary TRVs	<i>Dietary-based approach incorporating food chain transfer of contaminants from appropriate fish species (primarily pikeminnow and sucker). Assess dioxinlike contaminants using a TEQ approach based on appropriate surrogate fish tissue data. Use TRVs based on the most sensitive life stages, which include egg or embryo-based TRVs for DDT and metabolites, PCBs, and dioxin-like compounds. Egg concentrations will be determined by egg analysis or by food chain modeling.</i>	
		Egg dose compared to egg based TRV using fish to egg BAF		
Spotted Sandpiper ³	Survival, growth and reproduction	Dietary dose (empirical or modeled via food chain or FWM) compared to dietary TRVs	<i>Dietary based TRV approach. Sediment concentrations determined from site specific evaluation. In the absence of appropriate invertebrate tissue concentrations, use modeled invertebrate tissue concentrations.</i>	
Mink ⁶	Survival, growth and reproduction	Dietary dose (empirical or modeled via food chain or FWM) compared to dietary TRVs	<i>Dietary based TRV approach, considering both relevant fish species concentrations and invertebrate (crayfish) components of the diet. For dioxin-like contaminants (carp or appropriate prey species), use a TEQ-based approach to assess reproductive effects.</i>	
Amphibians				
Amphibians	Survival, growth and reproduction	Water exposure concentrations compared to AWQC or TRVs	<i>Water concentrations compared to literature-based values or AWQC to protect sensitive life stage.</i>	

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Plants				
Aquatic Plants	Survival, growth and reproduction	Bulk sediment concentrations vs. plant TRVs from sediment exposure (if available)	Comparison of emergent aquatic plant exposure based on concentrations of chemicals in sediment and relevant toxicological data.	
		Water exposure concentrations compared to AWQC or TRVs	<i>Water concentrations compared to literature-based values or AWQC to protect sensitive life stage (e.g., germination, emergence, early life stage growth).</i>	
		Transition zone water concentrations compared to AWQC or TRVs	<i>Water concentrations compared to literature-based values or AWQC to protect sensitive life stage (e.g., germination, emergence, early life stage growth).</i>	

Footnotes:

- ¹ For TBT, suggested screening value of 6,000 ng/g OC (based on 2 % OC), which represents a dry wt concncentration of 120 ng/g.
- ² Considered representative of fish exposure to PAHs. Analysis should include an analysis of whether these compounds are found in the diet of the fish receptors, as well as if found in tissue analysis.
- ³ Considered representative of sediment ingestion.
- ⁴ Carp is not a receptor of concern for the ecological risk assessment.; whole-body fish tissue (i.e., carp) was analyzed for dioxin-like chemicals, including PCB congener analysis, and is a surrogate for other fish species for these chemicals.
- ⁵Represents a resident broadcast spawner. Therefore, exposure to sensitive early life stages and eggs will be assessed to all contaminants, including PAHs and dioxin like compounds.
- ⁶Mink was selected to also represent river otter. Therefore, the dietary requirements of the river otter, which include a fish diet, must be
- ⁷Possible approaches for sturgeon will be developed through the ecological risk assessment TM process and the approach for the site will be selected following discussions between the LWG, EPA and its partners.